Amendments To The Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-36. (Canceled)

37. (Currently Amended) A reflection measurement apparatus which operates below deep ultra-violet (DUV) wavelengths, the apparatus comprising:

a light source, the light source providing a source beam including wavelengths at or below DUV wavelengths;

a sample channel light path;

a reference channel light path;

a spectrometer that receives light from the sample channel light path after the light has been reflected from a sample; ~~and~~

a detector that receives wavelengths of light at or below DUV wavelengths transmitted from an output of the spectrometer~~,~~; and

at least two environmentally controlled chambers connected via at least one coupling mechanism,

wherein the reference channel light path is utilized for referencing the reflectometer so that at least some reflectometer system characteristics may be obtained proximate in time to obtaining reflectivity data from the sample.

38. (Original) The apparatus of claim 37, the referencing enabling an adjustment of reflectance data obtained from the sample to account for apparatus or environmental changes between an apparatus calibration time and the time the sample reflectance data is obtained.

39. (Original) The apparatus of claim 37, further comprising at least one environmentally controlled chamber in which the sample channel light path and the reference channel light path are contained at least in part.

40. (Original) The apparatus of claim 37, wherein the sample channel light path is configured to encounter the sample and the reference channel light path is configured so that it does not encounter the sample, and wherein the sample channel light path and the reference channel light path can be selected through manipulation of one or more controllable apertures.

41. (Currently Amended) The apparatus of claim ~~40~~37, the sample channel light path and the reference channel light path sharing common portions of a diffraction grating and a detector.

42. (Original) The apparatus of claim 37 wherein sample channel light path and the reference channel light path are established using one or more beam splitter devices to divide the source beam and to subsequently recombine said divided portions such that they are directed to common diffraction elements and detectors.

43. (Original) The apparatus of claim 42 wherein the selection of sample channel light path or the reference channel light path is accomplished through use of controllable apertures in the form of optical shutters.

44. (Original) The apparatus of claim 42 wherein one or more of the beam splitter devices are partially transmissive beam splitters obscuring the entire beam diameter or fully reflecting mirrors obscuring some portion of the entire beam diameter.

45. (Currently Amended) A reflection measurement apparatus which operates below deep ultra-violet (DUV) wavelengths, the apparatus comprising:

a light source, the light source providing a source beam including wavelengths at or below DUV wavelengths;

a sample channel light path;

a reference channel light path;

a spectrometer that receives light from the sample channel light path after the light has been reflected from a sample; and

a detector that receives wavelengths of light at or below DUV wavelengths transmitted from an output of the spectrometer,

wherein the reference channel light path is utilized for referencing the reflectometer so that at least some reflectometer system characteristics may be obtained proximate in time to obtaining reflectivity data from the sample, and

~~The apparatus of claim 37,~~ wherein the sample channel light path and the reference channel light path are established using two or more controllable ~~controllable~~ beam stops in the form of motorized fully reflecting mirrors to direct the entirety of the source beam through either the sample channel light or the reference channel light path and to direct the reference channel light path and the sample channel light path to a common diffraction element and a common detector.

46. (Original) The apparatus of claim 37, wherein the reference channel light path and the sample channel light path are of near-equal optical path lengths in order to minimize environmental effects resulting from absorbing species that absorb wavelengths of below DUV.

47. (Currently Amended) A reflection measurement apparatus which operates below deep ultra-violet (DUV) wavelengths, the apparatus comprising:

a light source, the light source providing a source beam including wavelengths at or below DUV wavelengths;

a sample channel light path;

a reference channel light path;

a spectrometer that receives light from the sample channel light path after the light has been reflected from a sample; and

a detector that receives wavelengths of light at or below DUV wavelengths transmitted from an output of the spectrometer,

wherein the reference channel light path is utilized for referencing the reflectometer so that at least some reflectometer system characteristics may be obtained proximate in time to obtaining reflectivity data from the sample,

wherein the reference channel light path and the sample channel light path are of near-equal optical path lengths in order to minimize environmental effects resulting from absorbing species that absorb wavelengths of below DUV, and

~~The apparatus of claim 46~~ wherein reference and sample channels comprise balanced arms of an interferometer.

48. (Original) The apparatus of claim 47 wherein the interferometer is a Mach-Zehnder or Michelson interferometer.

49. (Canceled)

50. (Currently Amended) The apparatus of claim ~~49~~37, wherein sample channel light path and the reference channel light path are established using one or more beam splitter devices to divide the source beam and to subsequently recombine said divided portions such that they are directed to a common diffraction element and a common detectors

51. (Original) The apparatus of claim 50, wherein selection of one of the sample channel light path or the reference channel light path is accomplished through use of controllable apertures.

52. (Original) The apparatus of claim 50, wherein one or more of the beam splitter devices are partially transmissive beam splitters obscuring the entire beam diameter or fully reflecting mirrors obscuring some portion of the entire beam diameter.

53. (Currently Amended) The apparatus of claim ~~49~~37, wherein the sample channel light path and the reference channel light path are established using two or more controllable ~~controllable~~ beam stops in the form of motorized fully reflecting mirrors to direct the entirety of the source beam through either the sample channel light path or the reference channel light path to recombine the reference channel light path and the sample channel light path so that both paths have a common diffraction element and a common detector.

54. (Currently Amended) The apparatus of claim ~~49~~37, wherein reference channel light path and the sample channel light path are of near-equal optical path length in order to minimize environmental effects resulting from species that absorb wavelengths below DUV wavelengths.

55. (Original) The apparatus of claim 54, wherein the reference channel light path and the sample channel light path comprise balanced arms of an interferometer.

56. (Original) The apparatus of claim 55, wherein the interferometer is a Mach-Zehnder or Michelson interferometer.

57. (Original) The apparatus of claim 37, wherein the detector is an array detector that receives the multiple spatially separated wavelengths of light to enable reflectance data to be simultaneously obtained for multiple sites within a two-dimensional area of the sample.

58. (Currently Amended) The apparatus of claim 57, ~~wherein the~~ wherein the sample channel light path is configured to encounter the sample and the reference channel light path is configured so that it does not encounter the sample, and wherein the sample channel light path and the reference channel light path can be selected through manipulation of one or more controllable apertures.

59. (Original) The apparatus of claim 58, wherein the sample channel light path and the reference channel light path share a common diffraction element and and a common detector.

60. (Original) The apparatus of claim 58, wherein the sample channel light path and the reference channel light path are established using one or more beam splitter devices to divide the source beam and to subsequently recombine said divided portions such that they are directed to a common diffraction element and a common detector.

61. (Currently Amended) A reflection measurement apparatus which operates below deep ultra-violet (DUV) wavelengths, the apparatus comprising:

a light source, the light source providing a source beam including wavelengths at or below DUV wavelengths;

a sample channel light path;

a reference channel light path;

a spectrometer that receives light from the sample channel light path after the light has been reflected from a sample; and

a detector that receives wavelengths of light at or below DUV wavelengths transmitted from an output of the spectrometer,

wherein the reference channel light path is utilized for referencing the reflectometer so that at least some reflectometer system characteristics may be obtained proximate in time to obtaining reflectivity data from the sample,

wherein the detector is an array detector that receives the multiple spatially separated wavelengths of light to enable reflectance data to be simultaneously obtained for multiple sites within a two-dimensional area of the sample,

wherein the sample channel light path is configured to encounter the sample and the reference channel light path is configured so that it does not encounter the sample, and wherein the sample channel light path and the reference channel light path can be selected through manipulation of one or more controllable apertures, and

~~The apparatus of claim 58,~~ wherein reference channel light path and the sample channel light path are of near-equal optical path length in order to minimize environmental effects resulting from species that absorb wavelengths of less than DUV wavelengths.

62. (Original) The apparatus of claim 61, wherein reference channel light path and the sample channel light path comprise balanced arms of an interferometer.

63. (Original) The apparatus of claim 62, wherein the interferometer is a Mach-Zehnder or Michelson interferometer.

64. (Original) The apparatus of claim 57, further comprising at least one optical element that is a reflective optic.

65. (Original) The apparatus of claim 64, wherein the at least one optical element is an off-axis parabolic mirror.

66. (Original) The apparatus of claim 65, wherein the off-axis parabolic mirror has undergone conventional polishing to remove diamond turning artifacts introduced during its manufacture in order to improve imaging performance.

67. (Currently Amended) A reflection measurement apparatus which operates below deep ultra-violet (DUV) wavelengths, the apparatus comprising:

a light source, the light source providing a source beam including wavelengths at or below DUV wavelengths;

a sample channel light path;

a reference channel light path;

a spectrometer that receives light from the sample channel light path after the light has been reflected from a sample;

a detector that receives wavelengths of light at or below DUV wavelengths transmitted from an output of the spectrometer; and

at least one optical element that is a reflective optic.

wherein the reference channel light path is utilized for referencing the reflectometer so that at least some reflectometer system characteristics may be obtained proximate in time to obtaining reflectivity data from the sample,

wherein the detector is an array detector that receives the multiple spatially separated wavelengths of light to enable reflectance data to be simultaneously obtained for multiple sites within a two-dimensional area of the sample,

wherein the at least one optical element is an off-axis parabolic mirror, and

~~The apparatus of claim 65,~~ wherein the off-axis parabolic mirror is designed to operate 90° off central ray axis of mirror.

68. (Original) The apparatus of claim 64, wherein the reflective optics are coated with broad-band reflective coating to enhance reflectivity of below DUV wavelengths.

69. (Original) The apparatus of claim 68, wherein the broad-band VUV-UV reflective coating comprises aluminum and MgF_2.

70. (Original) The apparatus of claim 57, wherein the array detector is a charge coupled device (CCD).

71. (Original) The apparatus of claim 70, wherein the CCD is of the back-thinned, back-illuminated design.

72. (Original) The apparatus of claim 57, wherein the spectrometer is an imaging spectrograph designed in such a manner as to provide stigmatic imaging in a large area flat field through incorporation of corrective optics.

73. (Original) The apparatus of claim 57, wherein a beam conditioning module is introduced between the source and the spectrometer for the purposes of modifying the spatial or temporal coherence of the of the source beam or for modifying the spectral properties of the source beam.

74. (Original) The apparatus of claim 57, the apparatus being sufficiently compact so as to facilitate integration into process tools so that in in-line measuring, monitoring and control may be advantageously obtained.

75-90 (Canceled)